CLAIMS

We claim:

1. A system for controlling the inclination angle and rotation angle of a body comprising:

    a rotary actuator coupled to a base;

    a pivot actuator coupled to an output shaft of the rotary actuator, the rotary actuator controlling the angular position of the pivot actuator;

    a displacement member coupled to an output shaft of the pivot actuator, the pivot actuator controlling the linear position of the displacement member;

    a support shaft pivotably coupled to the displacement member; and

    a bearing including a fixed portion that is coupled to the base and a moving portion that is coupled to the support shaft, such that the angular position and linear position of the displacement member is translated to a corresponding rotation angle and inclination angle in the support shaft.

2. The system of claim 1 wherein the support shaft extends from the displacement member through the bearing.

3. The system of claim 1 wherein the bearing comprises a spherical bearing, wherein the fixed portion comprises a socket and wherein the moving portion comprises a ball.

4. The system of claim 1 further comprising a body coupled to the support shaft.

5. The system of claim 4 wherein the body comprises a munition, a plurality of submunitions, antenna, seismic sensor, acoustic sensor or optic sensor.

6. The system of claim 1 wherein the rotary actuator comprises a stepper motor.

7. The system of claim 1 further comprising a platform coupled to the output shaft of the rotary actuator, and wherein the pivot actuator is coupled to the platform.

8. The system of claim 1 wherein the pivot actuator comprises a linear actuator.

9. The system of claim 8 wherein the linear actuator comprises a stepper motor that induces motion in a threaded screw, and wherein the displacement member comprises a displacement carriage, the threaded screw communicating with a corresponding thread in the displacement carriage for inducing linear motion in the displacement carriage.

10. The system of claim 9 wherein the linear actuator further comprises a rail, and wherein the displacement carriage is slidably mounted to the rail.

11. The system of claim 8 wherein the linear actuator comprises a stepper motor that induces linear motion in the output shaft, the output shaft communicating with the displacement member for inducing linear motion in the displacement member.

12. The system of claim 1 wherein the support shaft includes a spherical bearing and wherein the displacement member includes a socket for communicating with the spherical bearing of the support shaft.

13. The system of claim 1 wherein the support shaft includes a disk bearing and wherein the displacement member includes a socket for communicating with the disk bearing of the support shaft.

14. The system of claim 1 wherein the base further comprises a shroud for housing the base and wherein the fixed portion of the bearing is coupled to the shroud.

15. The system of claim 14 further comprising a body having a weight coupled to the support shaft and wherein the weight of the body is substantially supported by the shroud.

16. The system of claim 1 further comprising a plurality of legs rotatably coupled to the body.

17. The system of claim 16 further comprising an articulated joint network for coupling the legs and a motor for rotating the joint network for collectively deploying the legs.

18. The system of claim 1 wherein the rotary actuator controls the angular position of the pivot actuator over a continuous range of angular positions.

19. The system of claim 1 wherein the pivot actuator controls the linear position of the displacement member over a continuous range of linear positions.

20. A system for controlling the inclination angle and rotation angle of a body comprising:

a base;

a rotary actuator;

a linear actuator;

a displacement member, the linear actuator controlling the linear position of the displacement member and the rotary actuator controlling the angular position of the displacement member;

a support shaft pivotably coupled to the displacement member;

a housing coupled to the base for housing the rotary actuator, linear actuator and displacement member; and

a bearing including a fixed portion that is coupled to the housing and a moving portion that is coupled to the support shaft, such that the angular position and linear position of the displacement member is translated to a corresponding rotation angle and inclination angle in the support shaft.

21. The system of claim 20 wherein the linear actuator is coupled to an output shaft of the rotary actuator, the rotary actuator controlling the angular position of the linear actuator.

22. The system of claim 21 wherein the displacement member is coupled to an output shaft of the linear actuator.

23. The system of claim 20 wherein the bearing comprises a spherical bearing, wherein the fixed portion comprises a socket and wherein the moving portion comprises a ball.

24. The system of claim 20 wherein the support shaft extends from the housing through the bearing.

25. The system of claim 20 further comprising a body coupled to the support shaft.

26. The system of claim 25 wherein the body comprises a munition, a plurality of submunitions, antenna, seismic sensor, acoustic sensor or optic sensor.

27. The system of claim 20 wherein the rotary actuator comprises a stepper motor.

28. The system of claim 20 further comprising a platform coupled to an output shaft of the rotary actuator, and wherein the linear actuator is coupled to the platform.

29. The system of claim 20 wherein the linear actuator comprises a stepper motor that induces motion in a threaded screw, and wherein the displacement member comprises a displacement carriage, the threaded screw communicating with a corresponding thread in the displacement carriage for inducing linear motion in the displacement carriage.

30. The system of claim 29 wherein the linear actuator further comprises a rail, and wherein the displacement carriage is slidably mounted to the rail.

31. The system of claim 20 wherein the linear actuator comprises a stepper motor that induces linear motion in an output shaft, the output shaft communicating with the displacement member for inducing linear motion in the displacement member.

32. The system of claim 20 wherein the support shaft includes a spherical bearing and wherein the displacement member includes a socket for communicating with the spherical bearing of the support shaft.

33. The system of claim 20 wherein the support shaft includes a disk bearing and wherein the displacement member includes a socket for communicating with the disk bearing of the support shaft.

34. The system of claim 20 further comprising a body having a weight coupled to the support shaft and wherein the weight of the body is substantially supported by the housing.

35. The system of claim 20 further comprising a plurality of legs rotatably coupled to the body.

36. The system of claim 35 further comprising an articulated joint network for coupling the legs and a motor for rotating the joint network for collectively deploying the legs.

37. The system of claim 20 wherein the rotary actuator controls the angular position of the displacement member over a continuous range of angular positions.

38. The system of claim 20 wherein the linear actuator controls the linear position of the

displacement member over a continuous range of linear positions.

39. A method for controlling the inclination angle and rotation angle of a body comprising:

controlling the angular position of a displacement member about a longitudinal axis of a base over a continuous range of angular positions; and

controlling the linear position of the displacement member relative to the longitudinal axis of the base over a continuous range of linear positions,

the displacement member being pivotably coupled to a support shaft of the body at a first position of the support shaft and the support shaft being pivotably coupled to the base at a second position of the support shaft such that the angular position and linear position of the displacement member is translated to a corresponding rotation angle and inclination angle in the support shaft.

40. The method of claim 39 further comprising coupling a body to the support shaft.

41. The method of claim 40 wherein the step of coupling a body comprises coupling a sensor or munition to the support shaft.

42. The method of claim 39 wherein controlling the angular position comprises controlling the angular position using a rotary actuator.

43. The method of claim 42 wherein the step of controlling the angular position includes using a stepper motor.

44. The method of claim 39 wherein controlling the linear position comprises controlling the linear position using a linear actuator.

45. The method of claim 44 wherein the step of controlling the linear position includes

inducing motion in a threaded screw.

46. The method of claim 45 wherein the step of inducing motion in a threaded screw includes communicating with a displacement carriage.

47. The method of claim 44 wherein the step of controlling the linear position includes inducing linear motion in an output shaft.

48. The method of claim 39 further comprising housing the base in a shroud and pivotably coupling the support member to the shroud.

49. The method of claim 48 further comprising coupling a body having a weight to the support shaft and substantially supporting the weight by the shroud.

50. The method of claim 48 wherein the step of pivotably coupling the support member includes using a spherical bearing.

51. A method for positioning a body comprising:

moving a support shaft through a continuous range of inclination angles relative to a base;

rotating the support shaft through a continuous range of rotation angles about an axis of rotation; and

moving a body coupled to the support shaft to a desired rotation angle and inclination angle.

52. The method of claim 51 wherein rotating the support shaft comprises rotating the support shaft using a rotary actuator.

53. The method of claim 52 wherein the rotary actuator comprises a stepper motor.

54. The method of claim 51 wherein moving the support shaft comprises moving the support shaft using a linear actuator.

55. The method of claim 54 wherein the linear actuator comprises a stepper motor that induces motion in a threaded screw, and wherein the support shaft is coupled to the linear actuator at a displacement member, the threaded screw communicating with a corresponding thread in the displacement member for inducing linear motion in the displacement member.

56. The method of claim 54 wherein the linear actuator comprises a stepper motor that induces linear motion in an output shaft, and wherein the support shaft is coupled to the linear actuator at a displacement member, the output shaft communicating with the displacement member for inducing linear motion in the displacement member.